Article

Blood glucose-lowering therapy in adults with type 2 diabetes

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Calculation Skills: Blood Glucose Lowering Therapy in Adults with Type 2 Diabetes

Approximately 90% of cases of diabetes are of Type 2 diabetes, where the body either becomes resistant to the effect of the insulin produced or produces inadequate amounts of insulin (Public Health England, 2014). Incidence of diabetes is rising, with 6% (2.7million) of people aged 17 years or over in England in 2013, diagnosed with diabetes. A range of complications are associated with type 2 diabetes, including retinopathy, neuropathy, nephropathy and cardiovascular disease (Diabetes UK, 2015). As such, the effective management of type 2 diabetes is essential and should be individualised and underpinned by patient education (National Institute of Health and Care Excellence [NICE], 2013).

Question 1
Based on the incidence figures above, what is the total population of people aged 17 years and over, on which these figures are based?

Question 2
Charlotte is a 46 year old administrator who was diagnosed with type 2 diabetes 10 months ago. Although classed as obese on diagnosis, she was receptive to the support given to assist in her weight loss and has maintained a normal weight for the past 4 months. However, despite making appropriate lifestyle changes, her HbA1c continues to range from 48-50 mmol/mol. It is agreed that she should commence drug therapy, which based on NICE (2015) guidance will be standard-release metformin.

(i) The regime agreed is 500mg daily for 1 week, 500mg twice daily for one week and then 500mg three times daily thereafter. How many 500mg tablets will need to be prescribed to complete the first 7 weeks of treatment?

(ii) Metformin tablets are available in two pack sizes: 28-tab pack costing 87p and 84-tab pack costing £1.00. What will be the most cost-effective pack combination for this 7 week treatment period (assuming packs will **not** be split) ~~whilst prescribing the **least** number of tablets over the required amount?~~

Question 3
Roger is a 31 year old retail manager who was diagnosed with type 2 diabetes 5 months ago. He has been unable to tolerate standard-release metformin and following an unsuccessful trial of modified-release metformin, it is agreed that sulfonylurea treatment is appropriate.

Sulfonylurea	**Dose**	**Cost**
Glibencamide	5mg daily adjusted according to response, max. 15mg daily	2.5mg 28-tab pack £18.50 5mg 28-tab pack 97p
Gliclazide	40-80mg daily adjusted according to response up to 160mg single dose, max. 320mg daily in divided doses	40mg 28-tab pack £3.36 80mg 28-tab pack £1.04 80mg 60-tab pack £2.23
Glimepiride	1mg daily adjusted according to response, max. 4mg	1mg 30-tab pack £1.20 2mg 30-tab pack £1.12 3mg 30-tab pack £7.25 4mg 30-tab pack £1.33
Glipizide	2.5-5mg daily, adjusted according to response up to 15mg single dose, max. 20mg in divided doses	5mg 56-tab pack £5.36
Tolbutamide	0.5-1.5g (max. 2mg) in divided doses	500mg 28-tab pack £22.64

Use the data presented in the table to answer the following questions.

(i) If Roger is prescribed Glibencamide 5mg daily for 4 weeks and this was increased to a maintenance dose of 7.5mg daily, how many tablets will he have taken in a 16 week period (assuming a tablet combination which requires the least number of tablets to be taken)?

(ii) If Roger's prescribed regime was Tolbutamide at a maintenance dose of 1.5mg daily (divided into three equal doses), how many packs (un-split) would he need for the period 1st March 2016 to 31st July 2016?

(iii) If Roger is prescribed Glimepiride with the following regime, assuming he has only 1mg tablets available to him in the first 3 weeks and 3mg tablets thereafter, what will be the cost of this 14 week treatment (assuming packs are not split)?

Weeks 1 & 2 - 1mg daily
Week 3 - 2mg daily
Weeks 4-14 (inclusive) – 3mg daily

(iv) What would be the cost difference for 2 months (assuming 30 days per month) treatment with a daily 160mg single dose of Glicazide or a daily dose of Glipizide 15mg?

Answers

Question 1

Based on the incidence figures above, what is the total population of people aged 17 years and over, on which these figures are based?

6% = 2700,000
1% = 2700,000 ÷ 6 = 450,000
100% = 450,000 x 100 = 45,000,000

Total population is 45 million

Question 2

(i) How many 500mg tablets will need to be prescribed to complete the first 7 weeks of treatment?

Week 1: 1 tablet per day = 7 tablets

Week 2: 2 tablets per day = 14 tablets

Week 3 -7: 3 tablets per day = 21 tablets x 5 weeks = 105 tablets

Total: 7 + 14 + 105 = 126

(ii) What will be the most cost-effective pack combination for this 7 week treatment period (assuming packs will **not** be split) whilst prescribing the **least** number of tablets over the required amount?

Required tablets = 126

Possible combinations:

5 x 28 pack (total 140 tablets) = 5 x 87p = £4.35

1 x 84 pack + 2 x 28 pack (total 140 tablets) = £1.00 + (2 x 87p = £1.74) = £2.74

2 x 84 pack (total 168 tablets) = £2.00 – this is the most cost-effective.

Question 3

(i) If Roger was prescribed Glibencamide 5mg for 4 weeks and this was increased to a maintenance dose of 7.5mg, how many tablets will he have taken in a 16 week period (assuming a tablet combination which requires the least number of tablets to be taken)?

1st 4 weeks = 1 (5mg) tablet daily x 28 days = 28 tablets
Weeks 5-16 = (1 x 5mg tablet + 1 x 2.5mg tablet) x 84 days = 2 x 84 = 168 tablets
Total tablets = 28 + 168 = 196

(ii) If Roger's prescribed regime was Tolbutamide at a maintenance dose of 1.5mg daily (divided into three equal doses), how many packs (un-split) would he need for the period 1st March 2016 to 31st July 2016?

Number of days = 31 + 30 + 31 + 30 + 31 = 153 days
Tablets per day = 3
Total tablets required = 153 x 3 = 459
Packs required = 459 ÷ 28 = 16.4 = 17 un-split packs

(iii) If Roger is prescribed Glimepiride with the following regime, assuming he has only 1mg tablets available to him in the first 4 weeks and 3mg tablets thereafter, what will be the cost of this 14 week treatment (assuming packs are not split)?

Weeks 1 & 2 - 1mg daily
Week 3 - 2mg daily
Weeks 4-14 (inclusive) – 3mg daily

Weeks 1 & 2 = 14 1mg tablets + Week 3 = 14 1mg tablets = 28 tablets (so 1 x 30-tab pack) = £1.20

Weeks 4 -14 = 1 x 3mg tablet x 77 days = 77 tablets (so 3 x 30-tab pack)
3 x £7.25 = £21.75

Total cost 1.20 + 21.75 = £22.95

(iv) What would be the cost difference for 2 months (assuming 30 days per month) treatment with a daily 160mg single dose of Glicazide or a daily dose of Glipizide 15mg?

Glicazide:
Daily dose: 160mg = 2 x 80mg tablets
60 days treatment = 2 x 60 = 120 tablets
Packs required = 120 ÷ 60-tab pack = 2
Cost = 2 x £2.23 = £4.46

Glipizide:
Daily dose: 15mg = 3 x 5mg tablets
60 days treatment = 3 x 60 = 180 tablets
Packs required = 180 ÷ 56-tab pack = 3.2 (4 un-split packs)
Cost = 4 x £5.36 = £21.44

Cost difference = 21.44 – 4.46 = £16.98

References

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